

Fluids Lab 1 (SPL1) – Assignment

Wind Tunnel Pitot Measurements

Learning Objectives

- Practice using pitot probe relations (Bernoulli, etc)
- Familiarization with tunnel test procedures
- Practice nondimensionalization of data

Experimental Rig

Test Article: 47:1 Boeing Blended Wing Body (BWB) in Wright Brothers Wind Tunnel

Instrumentation:

- Tunnel’s pitot-static probe. Reports $p_{o\infty} - p_{\infty}$ in Torr (mm Hg).
- Hand-held pitot-static probe. Reports $p - p_{\infty}$ in $10\times$ Torr.
($p - p_{\infty}$ reading must be multiplied by 0.1 to get Torr)

Test Conditions

Nominal tunnel speed: 40 mph

Angles of attack $\alpha = 0^\circ, 10^\circ$

Raw Data Acquired

1) For each angle of attack $\alpha \dots$

$p_{o\infty} - p_{\infty} \equiv q_{\infty}$ (from tunnel’s pitot-static probe)

$p(x) - p_{\infty} \equiv \Delta p(x)$ for $x = 2.5, 5, 10, 20, 30$ in along centerline (using hand-held pitot probe)

2) For $\alpha = 10^\circ \dots$

Approximate locations where

- Δp is a maximum (note the value)
- Δp is a minimum (note the value)

Normalized Data Presented

1) Top and bottom centerline C_p vs x/c_o for $\alpha = 0^\circ, 10^\circ$. (both curves on one plot). Model’s centerline chord is $c_o = 37.7$ in.

2) Locations of maximum and minimum Δp , indicated with dots on the BWB outline drawing provided. Also determine the local normalized velocity V/V_{∞} at these two locations.

Note: Submit only the 2-sided turn-in sheet provided. If the plot is clearly incorrect, partial credit can be given only if you show your work (equations used, sample calculations, etc).